

## DWC PROFILES: SIMON ASHFORD, PHD STUDENT IN THE DODD-WALLS CENTRE

Laser physicist and PhD student Simon Ashforth starts many of his days on a farm in his gumboots collecting bones from a home kill butcher. Back in the Photon Factory at Auckland University he is developing lasers for precision bone surgery. Simon spent his Honours year testing and proving

“FEMTOSECOND LASERS, WHICH DELIVER ULTRA-SHORT PULSES OF HIGH ENERGY LIGHT, ARE EXTREMELY EFFECTIVE AT CUTTING BONE WITHOUT DAMAGING THE SURROUNDING TISSUE. HE NOW HAS FUNDING FROM A US SURGICAL ROBOTICS COMPANY TO FURTHER DEVELOP THIS TECHNOLOGY WHICH HAS ENORMOUS COMMERCIAL POTENTIAL.”

“It is really exciting to be making a technology which could become a standard medical technique,” says Simon. “I’d love to be in the viewing gallery when the first procedure is being done.”

Simon’s project emerged from a chance meeting between his supervisor Cather Simpson and Catherine Mohr an ex-pat Kiwi who is Vice President of Medical Research at US company Intuitive Surgical. Having heard Cather speak about the weird and wonderful uses of femtosecond lasers, which can cut through almost any material with extreme precision, Catherine asked, “Could they cut bone?” Cather couldn’t see why not and brought Simon on board to investigate.

Bone surgery can be incredibly invasive. Some bone tumours, for example, grow on the inside of the skull and compress against the brain. To operate, surgeons currently have to take a big chunk out of the skull to remove the tumour, which is risky. Femtosecond laser pulses can be passed down an optical fibre the width of a human hair. So you could operate through a tiny incision or even through the nasal cavity. They could also be used to operate on the tiny bones in the ear which sometimes fuse together. So ideally it could bring back someone’s hearing.

Now halfway through his PhD, the next step is to try operating on mice.

“I applied for ethics approval and got all the relevant training to perform surgery on mice,” Simon says.

As far as he knows, no other group in the world has reached this stage of live animal testing.

“If all goes well we’ll look at integrating this into a surgical robot set-up, or even a hand-held device which the surgeon could use like a scalpel.”



Simon is keen to set up a company to produce the lasers and to keep working with Intuitive Surgical to take them to market.

### **The Photon Factory - a diverse, dynamic and supportive culture to grow a career**

When Simon first visited the Photon Factory he was blown away. It wasn't just the technology that impressed him (he had no idea how many things you could do with a laser). What really struck him was the passion of Cather and her students. Cather has taken great care to develop a culture that encourages each student to explore, work together, respect each other and expand their limits. The group has a mix of physicists, chemists, biologists and engineers working on projects ranging from fundamental physics to commercial application. Simon finds it is an incredibly dynamic and exciting place to place to work. He likens the camaraderie and teamwork in the group to his experience in the army in Singapore before coming to New Zealand.

"We're a really cohesive unit, just like my friends and comrades in the army.

Being part of the Dodd Walls Centre offers a wider network of support and knowledge for Simon to draw on.

"It's really great being able to approach a professor or student in another university and say 'hey, I'm from the Dodd Walls Centre, could you take a look at what I'm doing?' They also support us with funding for equipment and overseas conferences.

### **Student Opportunities - Conference organising, collaboration and inspiring kids**

In 2015 Simon was co-chair for IONS KOALA, an annual conference organised entirely by students for students across Australasia and beyond. This time it was held in Auckland and organised by a group of DWC postgraduates.

"I was involved in every aspect including planning the agenda and schedule, finding speakers and organising food and accommodation. It was a real challenge but I learnt so many vital skills. A highlight was meeting and working with Nobel Laureate Bill Phillips."

There were plenty of social occasions to relax, share ideas and form friendships.

"We set a whole day aside to spend at the beach and organised social events every evening," Simon says. "You'd think we wouldn't want to talk about science at those times, but it was quite the reverse. Being relaxed made us talk more and take more interest in others research. I made so many connections. Sometimes those networks are difficult to build but starting early when we are all on an even playing field as postgraduate students really helps. Ideally we'll maintain those friendships and connections when we become professors, associate professors and CEOs."

**"WE ARE ALL INTERESTED IN EACH OTHER'S WORK, WHICH HAS REALLY HELPED ME TO OVERCOME CHALLENGES AND MOVE FORWARD IN MY PROJECT. IF THERE'S SOMETHING I DON'T KNOW, I'VE GOT THE RESOURCES AROUND ME IN THE FORM OF AN ENGINEER OR A CHEMIST WHO CAN STEER ME IN THE RIGHT DIRECTION."**